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ABSTRACT

This master's project analyzed the implementation of a program designed to address the academic needs of all students in a heterogeneous classroom. The targeted population consisted of secondary parochial school students from working and middle class backgrounds in or around a large midwestern metropolitan area. Problems of underachievement were documented through surveys, interviews, and teacher observations. Analysis of probable cause data revealed that teachers tend to teach to average students and do not sufficiently address the special needs of the upper and lower ability ranges, resulting in students not being actively engaged in the learning process and failing to take responsibility for their learning. Three major categories of intervention were selected to incorporate higher-order thinking skills into students' daily activities: the integrated use of cooperative grouping techniques, the implementation and monitoring of student goals, and the development of student awareness of the intelligent behaviors concept. Results showed that students of all classes improved at the low end of the ability range, and three of the four classes improved at the average and high ends of the ability range. This seemed to indicate that using project-based learning to implement cooperative grouping, goal setting, and intelligent behaviors was beneficial to most students. (Appendices include funding sources, administrative study, teacher survey, sample lessons and projects, and an intelligent behaviors self-assessment survey. Contains 21 references.) (Author/EV)

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ADVANCING ACADEMIC ACHIEVEMENT IN THE HETEROGENEOUS CLASSROOM

by

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Submitted in partial fulfillment of the requirements for the degree of Master's of Arts in Teaching and Leadership

Saint Xavier University & IRI/Skylight

Field-Based Master's Program

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Abstract

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Title: Advancing Academic Achievement in the Heterogeneous Classroom

This report describes a program to address the needs of all students in a heterogeneous classroom. The targeted population consisted of secondary parochial school students from working and middle class backgrounds, located in or around a large midwestern metropolitan area. The problems of underachievement were documented through data collected from surveys, interviews and teacher observations.

Analysis of probable cause data revealed that teachers tend to teach to the average students, and do not sufficiently address the special needs of the upper and lower ability ranges. As a result students may not be actively engaged in the learning process and may fail to take responsibility for their learning.

In order to facilitate the incorporation of higher order thinking skills into daily activities, a review of solution strategies suggested by knowledgeable others, combined with an analysis of the problem setting, resulted in the selection of three major categories of intervention: the integrated use of cooperative grouping techniques, the implementation and monitoring of student goals, and the development of student awareness of the intelligent behaviors concept (Costa, 1991).

As a result of the interventions, the students of all classes improved at the low end of the ability range, and three of the four classes improved at the average and high ends of the ability range. This would seem to indicate that although the time during which the interventions took place was limited,using project-based learning to implement cooperative grouping, goal setting, and intelligent behaviors was beneficial to most students.

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Chapter 1

PROBLEM STATEMENT AND CONTEXT

General Statement of Problem

The targeted students at the extreme ends of the ability range in heterogeneous high school classrooms exhibit a lack of achievement. Evidence for this problem was gathered from data collected from surveys, interviews and teacher observations.

Immediate Problem Context

The student community is composed of approximately 1500 young women from uniquely diverse backgrounds. Currently, the population is 79 percent European American, 12 percent Mexican American, and 9 percent African American. The present population is 89 percent Catholic. Students come from over 200 different grammar schools; 77 percent coming from Chicago and 23 percent are from neighboring suburbs. Greater than 90 percent of the students live more than a mile and a half from school. The mean family income is between $36,000 and $45,000 with the majority of parents possessing a high school diploma. Approximately 25 percent have only completed grammar school while an additional 25-30 percent have completed some degree of post-secondary education. Many parents are employed in blue collar and service professions.

The school community is composed of approximately 80 faculty members and a support staff which includes administrative, custodial, and food service representatives. On average, the faculty possess 10.5 years of teaching experience. The educational background of the faculty ranges from recent college graduates to those pursuing doctoral work with the average having attained a Master's Degree.

The targeted secondary school is located in a single two-story building which contains classrooms, a gymnasium, a cafeteria, three computer labs, a library equipped with computers, a retreat center, chapel, guidance center, small theater, several multi-purpose meeting rooms, and various types of administrative offices. The building is designed to accommodate fine arts and physical education programs, business education classes, interdisciplinary programs, science laboratories, and regular academic programs.

As members of this community, each student engages in a college preparatory curriculum requiring four years of Christian living/religious studies, four years of language arts, a minimum of two and a half years of social studies, two years of both science and mathematics, two years of either reading or foreign language, and one half year each of computers, fine arts, and physical education. Students complete 15 core credits and 7.5 elective credits to meet graduation requirements. A service requirement of at least 60 hours is required beginning with the Class of 1997.

The average daily absence rate was 2.8 percent in 1993/94. This represents a decrease of .4 percent from the previous year. First period tardies were 6 percent in 1993/94, down from 14 percent in 1992/93. There was a full-time attendance officer and a phone mail system added during the 1993/94 school year which may have led to the decreases. The calculated cost per student is $3650. Funding comes from varied sources such as tuition, student fund raising, auxiliary enterprises, development income, and investment income. (Appendix A)

The Surrounding Community

The community is located outside a major midwestern metropolitan area. This area is bounded by several smaller suburban communities. It has a current population of 27,500 comprised primarily of middle class blue collar families. The 1990 census indicates the community population is 94.2 percent European American, 4.7 percent Mexican American, and 1.1 percent Asian. The community has no African American residents.

The area businesses are primarily small independent operations, but adjacent to this area is also an industrial area which houses several major corporations. The school and community have a limited relationship, but through service activities and outreach this relationship is expanding. The school is a member of the Chamber of Commerce and The Clergy Association.

The school is privately sponsored by a religious order and governed by a two-tiered Board of Directors. The order will promote the identity of a Catholic school where Gospel values such as truth, compassion and scholarship are an integral part of the curriculum. The administration also solicits teacher input regarding many educational decisions because "teacher ownership" is inherent in the school's philosophy. As a result, there is a working relationship among the administration, board and faculty.

Neighboring this all girls' school is a privately owned Catholic all boys' high school. In the past, the relationship between these two institutions has been very limited, but the current administration of both schools have been working to expand and strengthen this relationship. The local public high school works in cooperation with this school to obtain Title I Eisenhower Grant funds. Moving further into the community, there has been an effort by the administration to increase involvement with the local businesses. For example, students have been encouraged to volunteer time to local service organizations; businesses have been encouraged to establish professional contacts with students and maintain these contacts after graduation; and the school issues press releases highlighting student achievement in order to strengthen the academic image of the school.

Regional and National Context of Problem

The lack of achievement by students at the extreme ends of the ability range in a heterogeneous secondary classroom is not being adequately addressed. In the heterogeneous secondary classroom, many educators adopt a curriculum that targets students of average ability. The individual needs and differences of students need to be

addressed so all students receive a challenging education that results in substantial academic growth. According to Durden and Tangherlini (1993), individual differences often are not addressed because secondary educators are not willing to recognize they exist. In order for teachers to recognize these differences, they need to acknowledge that students develop their abilities at different rates and what challenges one child will be boring to another.

> . . . all children are intellectuals in that they are perpetually concerned with making new discoveries. They seek challenges. An education must address this fundamental drive, engaging the intellect and nourishing each child's development; otherwise, it is an encumbrance, an obstacle--oppression. (Durden & Tangherlini, 1993, p. 2).

Once educators recognize these individual differences they will be forced to make the necessary changes in their classroom curriculum to adequately deal with these different levels.

There is an accumulation of research to help educators meet this challenge. (Durden & Tangherlini, 1993). The average student has been getting most of the teacher's attention. The exceptionally bright student is painfully bored and the low ability student cannot be successful in the current lock-step curriculum (Hargis, 1989). According to Durden and Tangherlini (1993), "the teacher is merely doing her job, teaching to the middle of the class."

> Because the range of achievement can be so vast, most teachers plan the instructional program for the average, at-grade-level learner. Some modification is made for the bottom group and for the top group, but most instruction falls within the normal range. (Clark, 1992, p.158).

School districts across the U.S. have attempted to address these differences by developing programs to help students at the extreme ends of the ability range. In the past there were special programs designed to address the needs of the gifted and at-risk

students. Implementation of these special programs called for the focus of education to be changed from teacher-based to student-based.

> Teacher based education involves the lecture model of teaching. This type of instruction invariably misses the low achieving end of the continuum. If, on the other hand, the presentation is within the readiness threshold of all the students, then it will be inappropriate for the higher achieving members of the group. (Hargis, 1989, p.145).

The lack of meeting the needs of students with the low and high ends of the continuum precipitates the shift of focus from teacher to student-based instruction.

Some specific examples of programs implemented to target the students are the following: 1) non-specialist model (followed by Danish schools), 2) The Pyramid Project, 3) The Enrichment Triad/Revolving Door Model and the Secondary Triad Model, and 4) The Purdue Secondary Model for Gifted and Talented Youth.

The non-specialist model involves working with the same group of students for seven years. Students are allowed to move at their own pace. There is no emphasis on completing a specific set of curricular objectives in a year's time. The second program is the Pyramid Project. It begins with "a broad base of able learners whose individual needs are met by acceleration and enrichment in the regular classroom." (Clark, 1992, p. 189). The subsequent levels of the pyramid are occupied by fewer students with greater specialized needs. The third program is the Enrichment Triad/Revolving Door Model and the Secondary Triad Model. This model "assumes that the concept of giftedness reflects behavior resulting from an interaction among three basic clusters of human traits, that is, above average general and/or specific abilities, high levels of task commitment, and high levels of creativity." (Clark, 1992, p.189). This model is unique in that it states that gifted behaviors can be developed. The fourth and final model is the Purdue Secondary Model for Gifted and Talented Youth. This program "offers a range of choices and possible

structures to meet the diverse cognitive and affective needs of gifted, talented, and high ability students." (Clark, 1992, p.191).

These programs attempted to address the needs of gifted and at risk students. Since the inception of these programs, many changes have taken place. These programs have evolved from separate classrooms to pull-out programs and again ending with an inclusion type program. Since the trend today is away from ability grouping, this inclusion usually takes the form of a heterogeneous classroom where the teacher is left to deal with individual differences. However, if differences are not met students will not realize their full abilities. Durden and Tangherlini (1993) reported, "In recent years critics have argued that our nation's schools are neither preparing the majority of our citizenry for any but the most menial forms of employment nor nurturing 'the talented tenth' to realize their full potential." (p.7). Ultimately, by strengthening the education of the most able students, all students will benefit because minimum levels of accomplishment will also be raised. (Office of Educational Research and Improvement , 1993). Excellence for all students must be the norm.

Chapter 2

PROBLEM EVIDENCE AND PROBABLE CAUSE

Problem Evidence

In order to document the lack of student achievement in the heterogeneous classroom information was taken from a study which was performed by the administrative staff and presented at a faculty inservice. (Appendix B). Evidence of student performance was collected from a comparative analysis of four years of standardized test scores, random faculty and student surveys, and interviews with faculty and students.

A comparison of the PLAN and ACT percentile scores in math and science showed that the PLAN scores predicted much higher ACT scores than students actually received. This pattern was consistent for all students randomly selected, including state scholars.

The results of comparing the CAT/5 entrance exam with the CAT/5 administered during senior year showed that students who scored poorly on the entrance exam showed marked improvement when taking the exam their senior year. However, students who scored in the middle percentile actually showed a decline senior year, and those who scored well on the entrance exam showed little or no improvement.

An analysis of the ACT Study Power Assessment showed that the majority of the targeted students fell in the low category, which suggests that they lack skills of managing time and environment, reading textbooks, taking notes, using resources, preparing for tests, and taking tests.

Student questionnaires which surveyed critical thinking skills indicated that brainstorming was the only strategy frequently used by the students. Faculty responses indicated a limited use of critical thinking strategies in the classroom.

An analysis of CAT/5 scores which reflect critical thinking skills of analytic processing as demonstrated in math and science showed that overall, students score below the national average. After evaluating the data, it was concluded that critical thinking usage needs to be expanded in the classroom.

The data also showed a correlation between maturity and the student's ability to create personal problem-solving models. Students cite their education as being a strong influence in their current decision making process. Although decision-making and personal problem-solving seem to be areas of growth for our students, the report concludes that their academic problem-solving needs attention.

FIGURE 1

Probable Causes

In response to question 1 of the teacher survey (Appendix C), 89 percent of the respondents said they planned their classes for the average student (Figure 1). This could be one reason why the needs of students at the high and low ability levels are not being met. Most teachers, however, realize that there are problems with challenging all ability

levels; although they can easily identify the different ability levels of their students, they state that time constraints within the allotted class periods are a major factor in addressing this issue.

Table 1

TEACHER SURVEY RESULTS

	SA	A	D	SD
ADEQUATE CLASSROOM TIME TO ADDRESS NEEDS	2	15	18	11
IDENTIFIES STUDENTS' ABILITY LEVELS	9	28	9	0
STUDENTS ARE SELF-DIRECTED LEARNERS	0	8	27	11
STUDENTS ARE PERSISTENT	0	11	32	3
STUDENTS REQUIRE CONSTANT STIMULATION	14	28	4	0
STUDENTS USE HOTS REGULARLY	2	18	24	2
STUDENTS ARE CHALLENGED BY EXPECTATIONS	9	34	3	0
STUDENTS SET & MONITOR GOALS	1	15	27	3

SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree

The survey reported that the overwhelming majority of teachers believe their students require constant stimulation to learn, (Table 1) and that their students were not self-directed. This corresponds with the findings of Durden and Tangherlini (1993) who stated that students do need stimulation to learn and that the majority are not self-directed in the learning process. Stimulation is important to help students become actively engaged and take responsibility for their own learning. Researchers have suggested that giving students no choices in pursuing areas of interest or in working through their preferred learning styles will result in a lack of student interest. (Baum, Renzulli, & Hebert, 1994; Butler-Por, 1987) Part of self-directed learning requires students to evaluate their progress in the classroom setting. However, over 60 percent of the teachers do not include goal-setting and monitoring as part of their classroom curriculum. These skills are important if students are to become self-directed and achieve their potential (Baum, Renzulli, & Hebert, 1994).

Through cooperative group activities, teachers are given an opportunity to monitor active learning as it takes place. Because teachers are freed from the role as presenter, they can take a more active role as monitor. This new role enables teachers to observe the students' social interaction and application of thinking skills. Based on the responses to question 7, the teachers were divided in their observation of higher order thinking skills in their classrooms. Although 56 percent reported observing higher order thinking skills, 76 percent thought students did not show perseverance when challenged, which, according to Costa (1991) is a necessary intelligent behavior. Lack of persistence and commitment prevents students from being self-directed and staying actively engaged in their learning (Butler-Por, 1987).

Table 2

TEACHER SURVEY RESULTS

	YES	NO
I have sufficient strategies		
to address all ability levels	15	31
I plan extra activities or use additional		
strategies to address students' individual needs	35	11

Research has shown cooperative groups are one way to encourage active learning and social interaction. Many educators do use cooperative grouping, but are unfamiliar with other strategies to reach all ability levels. Of the survey respondents, 67 percent feel they do not possess sufficient strategies to reach all ability levels. According to Butler-Por (1987) and Oakes (1986), lack of instructional methods for teaching different ability levels contributes to teachers' inability to reach these students. Although 76 percent of the teachers reported that they attempt to reach the high and low level students through the use of extra activities, many explained that these activities were extra-credit assignments not necessarily specified for the higher or lower ability levels.

Chapter 3

THE SOLUTION STRATEGY

Review of the Literature

A current trend in education combines students of all ability levels into a heterogeneous classroom. The multi-level classroom presents difficulties for teachers who were previously teaching in homogeneous classrooms. Research suggests a variety of solutions to address the problem of reaching all ability levels in a heterogeneous classroom. The one solution common to all research is for the student to be actively engaged in the learning process. A student who is actively engaged has control of the type and quality of learning, which results in student accountability. The learner is self-directed, makes choices related to the assignment, and takes ownership of the task (Marzano, 1992). Cohen (1972) stated that active learning means learning about concepts and ideas by talking, explaining, and arguing with others. The U.S. Department of Education reported that there is a direct correlation between the amount of time students are actively engaged in learning and their academic achievement (What Works, 1986). Properly designed group work is one way to produce active learning because it keeps students involved with their work and manages students with a wide range of abilities. (Cohen, 1972).

Cooperative grouping has many advantages when used in the heterogeneous classroom. According to Winebrenner (1992), students engaged in cooperative learning show significant gains in achievement and social interactive skills. She explained that

besides the classroom, the adult workplace also requires constant cooperative interaction, so it is imperative that the students learn how to use a variety of skills in working with others. In addition, because of the structure and nature of cooperative groups, mostly all students experience more success than if they were working independently. Cohen found that there are other advantages as well. Cooperative grouping helps the low achieving student stay on task, and it keeps the rest of the class engaged when the teacher is giving individual attention. It encourages the upper level students to use their resources to help other group members which allows teachers to challenge all students intellectually rather than teach to the lowest common denominator (1972). It also gives all students the opportunity to "teach" or "coach" their peers, a practice that Hargis maintains is necessary and normal in a success-orientated cooperative learning environment (1989). A well-structured cooperative classroom changes the teacher's role from one who imparts knowledge to one who organizes and assists the groups in discovering their own knowledge (Baum, Renzulli, Hebert, 1994). Because of this role change, students become more active learners (Cohen, 1972).

Although the benefits of cooperative grouping have been demonstrated in more than five hundred studies (Bellanca, Fogarty, 1991), Conroy discussed a possible disadvantage of using the mixed-ability cooperative approach with gifted students. She pointed out that if high-ability students are always heterogeneously grouped, they will never get the opportunity to see how far they can go with a given task. Periodically they need to be grouped with other gifted students so they can challenge each other to their limits. Winebrenner agreed with this concept. In her book, *Teaching Gifted Kids in the Regular Classroom,* she emphasized that although cooperative grouping is valuable for all students, gifted students sometimes need their own appropriate cooperative experiences. She took issue with Slavin when he said that gifted students working in heterogeneous cooperative groups "were no worse off than they were in more traditional classrooms" because his research excluded the top five percent of the student body. She stated that

"no worse off" was not synonymous with "better off," and she offered many suggestions for addressing the gifted students in a heterogeneous classroom (1992).

Despite Conroy's and Winebrenner's observations about cooperative learning and the gifted student, both authors agree that well-structured cooperative activities are advantageous to all learners because such assignments encourage students to explore concepts in depth, require higher order thinking skills (Conroy, 1993) and insure a degree of success for all ability levels (Winebrenner, 1992). One way to insure active learning in cooperative groups is through project-based activities.

Project-based learning consists of assignments that take longer than one period to complete, require a synthesis of the higher order thinking skills, and have some manner of publication or presentation. White, Blythe and Gardner (1992) promote project-based learning because projects allow students to choose topics or strategies that fit their interests--important if students are to become self-directed learners. By working on long-term projects, students will learn that there are multiple ways to approach assignments and will automatically use their strengths to accomplish their tasks. In addition, projects give students the opportunity to develop interpersonal skills and present information in other ways besides writing (Costa, Bellanca, Fogarty, 1991). Project-based learning has even reversed underachievement in unmotivated students because it valued their interests and allowed them to work in their preferred learning styles. Studies have shown that other benefits, which apply to both low ability and high ability students, included an increase in self-esteem, self-direction, and overall motivation (Baum, Renzulli, Hebert, 1994). The nature of long-term projects promotes active learning where the students are responsible for their progress. Goals need to be set and monitored, questions need to be formulated, strategies need to be developed, information needs to be synthesized, decisions need to be made as to method of presentation, and evaluations need to be done in order to maximize the learning process. A well-planned cooperative group can provide the structure for this to take place.

Goal setting, one of the first steps in completing a long-term project, is an important component of active learning because it enables students to take responsibility for their own progress. According to Barell, the most successful people decide what they want, figure out how to get there, and continually monitor progress toward that goal, but most schools do not allow students to do this on their own. By designing and implementing strategies and reflecting on their progress, students will develop skills that are transferable to any area of life (1991). Marenbloom stated that this process will help students see the connections between content, skill, and personal development. Since it has a practical application, it is also a motivational tool that will help students prepare for the thinking process inherent in active learning (Costa, Bellanca, Fogarty, 1992). Bellanca and Fogarty stressed the importance of goal setting when they said that it should be an integral part of cooperative grouping. They suggested that base groups set aside time at the beginning of the week and at the end of the week to set goals and monitor their progress. Thus the group becomes a facilitator in the process of active learning.

Another way projects actively involve learners is that they require students to use higher order thinking skills. Rather than having students only repeat and explain information that they have learned, teachers should challenge students to problem-solve by using the upper levels of Bloom's Taxonomy--analysis, synthesis, and evaluation (Feldhusen, 1986). Contrary to what some teachers believe, Means, Chilemeer, and Knapp (1991) point out that students do not need to master basic skills before they are taught advanced thinking skills. For example, in reading they can check to see if new information fits into what they have already read, and they can predict what is to follow even if they have an incomplete mastery of decoding (Oakes, 1986). This philosophy is reinforced by Braddock and McPortland (1990), who found that as long as teachers concentrate on the higher order thinking skills, students will improve no matter what level their present achievement. However, teachers should keep students working at the levels at which they can best succeed and achieve (Hargis, 1989). The way to do this is to

actively engage the students through activities and projects that require students to use higher order thinking skills. Costa (1991) believes higher order thinking skills are so important that they should become the content of curriculum and instruction. He admitted that installing a program in the curriculum for teaching thinking skills will require time, patience, and practice, but it is important because these metacognitive skills developed through a student-centered curriculum will be used for life. This curriculum-based approach enables teachers to meet the individual needs of the students which are directly related to the scope and sequence of the school. In developing activities based on advanced thinking skills for the heterogeneous classroom, teachers should include:

--activities that provide for several ability levels

--activities that accommodate a variety of interest areas

--activities that encourage the development of sophisticated products

--concepts that are consistent with the comprehensive curriculum plan (Maker, 1993).

Oakes cautions, however, against an inflexible lock-step curriculum:

> As long as curriculum is presented as a sequence of topics and skills that require prerequisite knowledge and prior mastery of certain skills, teaching heterogeneous groups of students will remain problematic... Many curriculum experts argue that "scope and sequence" approach does a disservice to students regardless of whether they are slow or quick and regardless of whether they are in heterogeneous or tracked classes. They suggest that the curriculum that is well-suited to diverse groups of students is the curriculum to be preferred in all settings (Oakes, 1986, p. 151).

If properly planned, these activities would focus around the higher order thinking skills that would be carried out through carefully structured group activities.

An additional advantage of project-based learning is that it creates situations where students do not immediately know the answers; they are faced with complex problems and are forced to solve them in some way. When students use particular strategies to successfully solve these problems they are demonstrating intelligent behavior. Costa synthesized evidence gathered by various researchers that characterize effective problem-solvers. He suggested that the following characteristics be taught and observed by parents and teachers:

1. persistence
2. decreasing impulsivity
3. listening to others with understanding and empathy
4. flexibility in thinking
5. awareness of thinking
6. checking for accuracy and precision
7. questioning and problem solving
8. applying past knowledge to new situations
9. precision of language and thought
10. creativity

According to Costa (1991), these characteristics should be taught and monitored through long-term complex tasks because it is through projects that students learn not only content but these ten skills that will be continually refined through life-long education. Thus students will be actively engaged in learning by monitoring goals and solving problems using higher order thinking skills, which will help them develop the dispositions of intelligent behavior.

Project Outcomes and Solution Components

> As a result of using strategies to advance student academic engagement and individual accountability in cooperative group settings, during the period of September 1995 to February 1996, the targeted secondary

students will increase individual achievement as measured by teacher constructed tests, observation checklists, student surveys, and the Cornell Critical Thinking Test.

In order to accomplish the terminal objective, the following processes are necessary:

1. Students will be placed in heterogeneous base groups.
2. Task groups will be used on a regular basis.
3. For each unit, students will set an individual goal and monitor their progress toward attaining that goal.
4. The targeted content areas of science and language arts will use Costa's intelligent behaviors and learning preferences to explore problem solving activities.

Action Plan for the Intervention

1. Students will be placed in heterogeneous base groups.

Base groups will consist of three to four students.

Base groups will be established the first week of school.

Criteria used to establish base group will be:

1. CAT-5 scores
2. Learning preference styles (Appendix D)
3. Critical thinking questions (Appendix E)

Students will be in their base groups unless regrouped into a task group.

Base groups will be study groups and long-term project groups.

Base groups will also be used for goal setting, clarification of ideas and concepts, learning and practice of higher order thinking skills and problem-solving skills. (Appendix F)

Journaling will be done in base groups a minimum of three times a week.

2. Task groups will be used on a regular basis.

Task groups will be comprised of three to five students.

Task groups will be short term project or lab based groups.

Students will be randomly assigned to task groups.

Task groups will meet as needed for short-term labs, hands-on activities, jigsaw activities, and application of higher order thinking skills and problem-solving skills.

3. For each unit, students will set an individual goal and monitor their progress toward attaining that goal.

Goal setting will be discussed at the beginning of the school year using two to three 20 minute time blocks. (Appendix G)

Different strategies for goal setting (i.e. KWL) will be modeled. (Appendix H).

New goals will be set at the beginning of each unit.

4. The content areas in targeted science and language arts classes will use intelligent behaviors and learning preferences to explore problem-solving activities.

Project-based learning activities will be used in classes (Appendix I).

A long-term project will be assigned which will be done in the base group and due at the end of the semester. Topic will be of groups choosing.

Costa's intelligent behaviors will be taught in ten 15 minute mini-lessons.

Problem-solving activities will be used to facilitate the use of:

posing questions

making predictions/hypothesis

experiments

data collection and graphing

interpreting data

making inferences/drawing conclusions

Methods of Assessment

In order to assess the effects of intervention, the Cornell Critical Thinking test will be administered as both a pre- and post-test. Teacher constructed tests will also be given to assess any increase in students' individual achievement. In addition, peer coaching among members of the research team, and teacher and student observations will be used to monitor the progressive development of Costa's intelligent behaviors.

Chapter 4

PROJECT RESULTS

Historical Description of Intervention

The object of this project was to increase the individual achievement of students in a heterogeneous classroom. Intelligent behaviors, learning style preferences, and goal setting and monitoring were explored in heterogeneously based groups and randomly selected task groups.

Base groups were used for study, for clarifying concepts and ideas, for long-term projects, and for practicing higher order thinking skills through problem solving activities. Task groups were designed for short-term projects, jigsaws, lab-based and hands-on activities as well as exploring problem-solving skills.

Individual goal setting and monitoring was used to help students establish goals and monitor their progress toward those goals. Learning preferences were determined and used to set up the base groups. Base groups also provided a setting where project based learning activities and/or long term projects were facilitated. Because of time constraints, the ten original intelligent behaviors were narrowed to four which were explored through mini lessons or activities. These were monitored through observation checklists or journal self-assessments. Problem-solving activities included the posing of questions; forming predictions and hypothesis; experimentation, data collection, interpretation and graphing, as well as making inferences and drawing conclusions.

Due to restrictions of a daily class schedule, the planned number of interventions was altered. Besides limiting the number of intelligent behaviors observed, members of the research team were unable to participate in peer coaching to monitor the progressive development of Costa's intelligent behaviors.

All four classes, hereafter referred to as A, B, C, and D, focused on carefully selected base groups and randomly selected task groups. The Learning Channels Preference Checklist and entrance exam scores were used to determine base groups.

In classroom A, a ninth grade language arts class, the base groups consisted of one auditory, one haptic, and two visual learners of varying academic abilities. Self-evaluative journaling was used after major projects and papers. This class used a project-based learning activity in connection with a Shakespearean project (Appendix J).

In classroom B, a tenth and eleventh grade chemistry class, the base groups consisted of one visual, one auditory, and two haptic learners of varying abilities. Journaling was done twice weekly as a way to set and monitor long and short term goals. Journaling was done occasionally on other current topics as time permitted. Problem-based learning activities were used on occasion such as labs and review activities (Appendix K).

In classroom C, a ninth grade biology class, base groups consisted of one visual, one auditory, and two haptic learners. This class focused on personal accomplishments by using journaling and self-evaluation to monitor goals and metacognition. Project-based learning activities were used in lab situations and the semester assessment (Appendix I).

In classroom D, a ninth grade biology class, the base groups were constructed of two visual, one auditory and one haptic learner. Randomly selected task groups were used upon occasion for various classroom activities. In this class, long-term goals were set at the beginning of each quarter and weekly short-term goals were monitored daily through journaling. Project-based learning activities were used in lab situations and the semester assessment (Appendix I).

Presentation and Analysis of Results

Initially, the entrance exam scores (CAT 5, level 19) for the freshmen, the CAT 5, level 21 exam for the sophomores, and the PLAN for the juniors were intended to be used

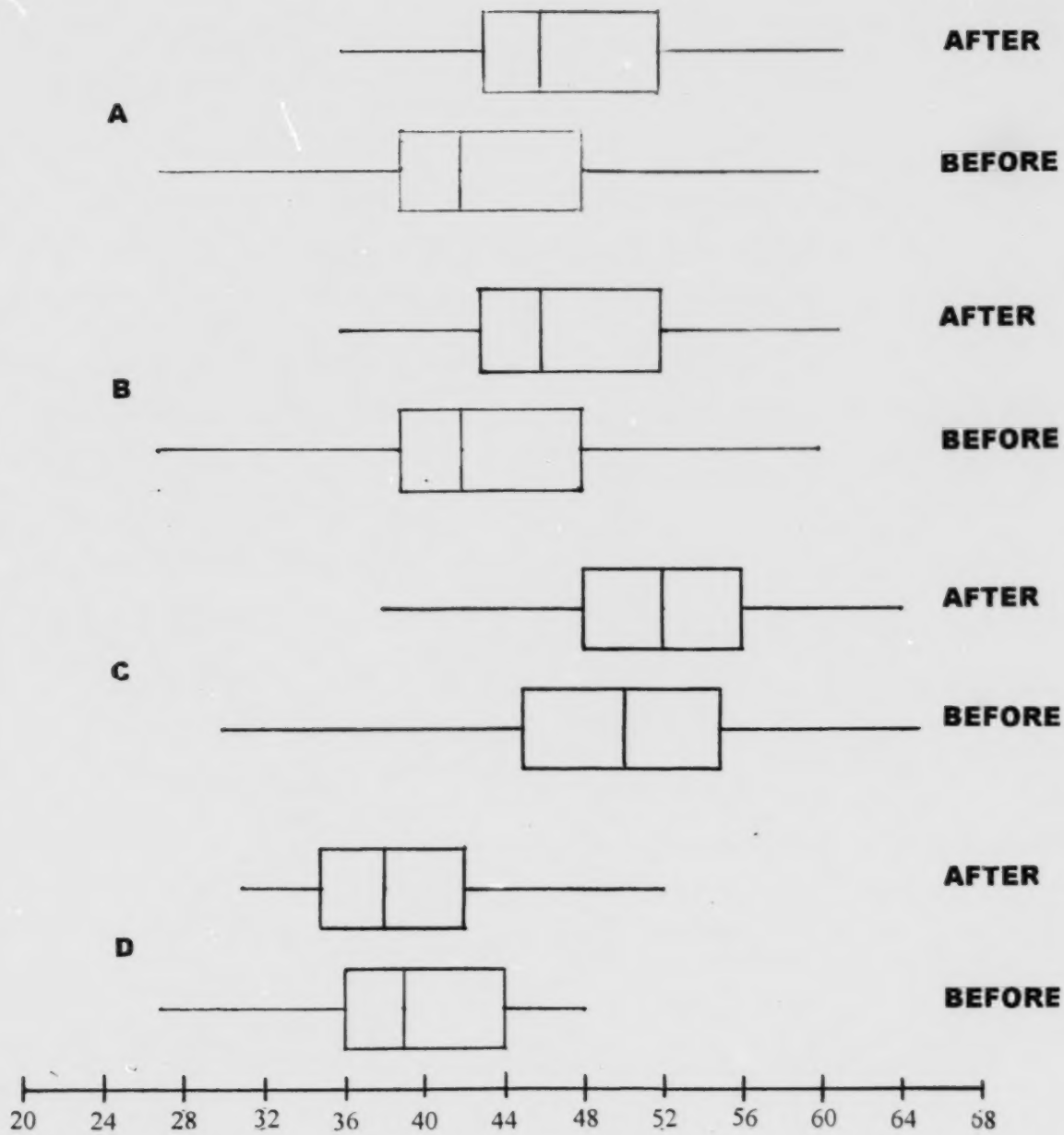
to set up heterogeneous base groups and as the pre-test. It was not possible to use these as post tests because according to the school's schedule, these tests would have been administered before the intervention was in effect for an extended period of time. Therefore, the Cornell Critical Thinking Level X (Ennis, Millman, 1985) test was chosen as the standardized pre and post tests. The results of the exams are presented in Table 3 (page 23) as box plots of the before and after scores for each classroom. The box plot shows the low score, the high score, the twenty-fifth percentile, and the seventy-fifth percentile for each of the four classrooms. The low score went up nine points for classroom A, nine points for classroom B, eight points for classroom C, and four points for classroom D. The high score went up one point for classroom A, one point for classroom B, and four points for classroom D, but it went down one point for classroom C. The average score increased one point for classroom A, almost four points for classroom B, four points for classroom C, but classroom D showed a .62 point decrease. The overall results show there was an increase in the scores at the low end of the scale and a shift upward in the scores in the middle twenty-fifth to the seventy-fifth percentile range. The scores from each classroom were tested for practical significance and those from classrooms A, B, and C showed a significant change in scores.

Students were almost evenly divided about the benefits of goal setting. They responded to the journal stem "Goal setting has/has not helped me in this class because..." Negative responses included the following reasons: students did their work whether or not they set goals; students just never bothered to look at their goal after they wrote it down; the goal that the student set was too difficult to achieve or that the time allotted was not sufficient to achieve it. However, some students felt regular goal setting wasn't beneficial but it did become useful during long-term projects or while pacing the reading for a book report.

These students who favored regular goal-setting and monitoring seemed to do so for reasons of self-improvement or self-esteem. Many stated that the practice kept them

Cornell Critical Thinking Test Results

Table 3



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focused and on task; work was completed that would not have been done without the constant reference to their goal. Some students said they were more motivated to reach their goal because it was written down and they felt a responsibility to accomplish it. Most who favored goal setting mentioned the feeling of satisfaction and improved self-confidence when their goals were reached.

A survey given to teachers at the beginning of the year seemed to indicate a lack of intelligent behaviors practiced by their students. The research team addressed four of these intelligent behaviors: persistence, questioning and problem solving, precision in language and thought, and applying past knowledge to new situations. This was done by class discussion, teacher feedback, and student journaling. At the end of the intervention period, a student self-assessment survey was given (Appendix L). According to the survey, (Table 3), seventy-four percent of the students felt they were always or often persistent, seventy percent said they always or often used questioning or problem-solving skills, seventy-one percent thought they exhibited precision of language and thought, and eighty-seven percent believed they deliberately applied past knowledge to new situations. In addition, although creativity was not directly addressed, students felt that they always or often were creative in their approach to projects when the assignments offered an opportunity to do so. The majority of the students seem to be satisfied with their performance of the targeted intelligent behaviors.

Table 4

Student Self-Assessment of Intelligent Behaviors

INTELLIGENT BEHAVIORS	0	1	2	3
PERSISTENCE	3	24	58	17
QUESTIONING & PROBLEM SOLVING	4	27	50	21
APPLYING PAST KNOWLEDGE TO NEW SITUATIONS	2	13	46	41
PRECISION OF LANGUAGE & THOUGHT	4	26	51	21
CREATIVITY	4	17	39	42

Conclusions and Recommendations

Based on the presentation and analysis of the data in critical thinking, the low end of the ability level in the four heterogeneous classroom, grades 9-11, showed a significant improvement as measured by the Cornell Critical Thinking Test. Three of the four classes also showed a moderate improvement for the average and high ability levels; one class showed a decrease in achievement level in the average and high ability levels by only one point. The reason for the moderate gains or the decrease may have been the limited period of the intervention--greater differences may have been seen if the trial period had been a full year. Students were told that although important, the results of this test would not affect their academic grade. Therefore, some students may not have taken the post-test seriously. In the class that showed a decrease, some students did not seem committed to the strategies that were being offered, which in turn may have adversely affected their post-test results. On the other hand, increases may have been positively affected by opportunities presented by project-based activities and goal setting. Also, focusing on an awareness of intelligent behaviors may have increased their ability for critical thinking.

Based on student journals, results of the goal setting strategies were varied. The students who appeared to benefit the most were those in the middle and lower ability ranges. They seemed to appreciate the organization that goal setting provided. Several even mentioned that they transferred goal setting to other classes. Students in the higher ability range seemed to respond more negatively to goal setting. Since they generally were the better student, and had little trouble completing their assignments, many felt goal setting wasted their time. This may have occurred because these students did not set appropriate goals. They seemed to believe that the main objective was just to accurately complete the assignment rather than to challenge their abilities.

Goal setting can be useful when monitored on a regular basis. The key seems to be to provide class time to be sure this occurs. If monitoring were done in class rather than as a homework assignment, those students who found journaling about their goal

"burdensome" would not have to take extra time to do so. Other students who lack the organizational skills to again refer to their goal will do so as an in-class activity. For those who feel their goal is too difficult, class time and discussion would allow them to re-set a more realistic goal. In addition, in order to encourage students to set meaningful rather than frivolous goals, the teacher should model appropriate and inappropriate examples.

Although daily or weekly goal setting may be too frequent, writing unit or quarterly goals may be more effective; then students could monitor them, through journaling, once or twice a week. As the students are doing so, the teacher could stamp or initial each reflection to ensure all students participate. By this practice, more students may be able to recognize the positive results of goal setting.

According to student surveys, the majority of students believe they were practicing the targeted intelligent behaviors, although teachers of the research team did not necessarily agree with their perceptions. Emphasis on intelligent behaviors in the classroom may have contributed to the students' inflated perceptions. Another possibility is that classroom projects afforded the students many opportunities to incorporate the intelligent behaviors and since their grades were satisfactory for the projects, students naturally assumed they were practicing these behaviors.

The number of targeted intelligent behaviors should be limited to one a quarter. This would help address the time constraints experienced by the research team. Also, student surveys did not seem to be an accurate assessment of the students' use of intelligent behaviors. It would be beneficial to administer a pre and post evaluation.

As a result of using cooperative base groups, goal setting and intelligent behaviors in order to facilitate higher order thinking skills, there was a definite improvement in student achievement at the low end of the ability range in the classroom. The benefits to the average and high ability students were less defined. When teaching classes that are heterogeneously grouped it is difficult to adequately challenge all ability levels. One of the biggest contraints seems to be time. Longer class periods would enable teachers to

implement more project-based activities and to place more emphasis upon the intelligent behaviors. Cooperative grouping and goal setting would be an essential component of these activities.

In addition to longer class periods, students would benefit from teachers having fewer students overall. This would make it easier for teachers to monitor the intricacies of project-based activities such as goal setting, problem solving, and using the intelligent behaviors. This would be one way to ensure that all students are adequately challenged. Implementing block scheduling may be a viable alternative to the traditional class schedule in order to provide longer class periods with less students per teacher.

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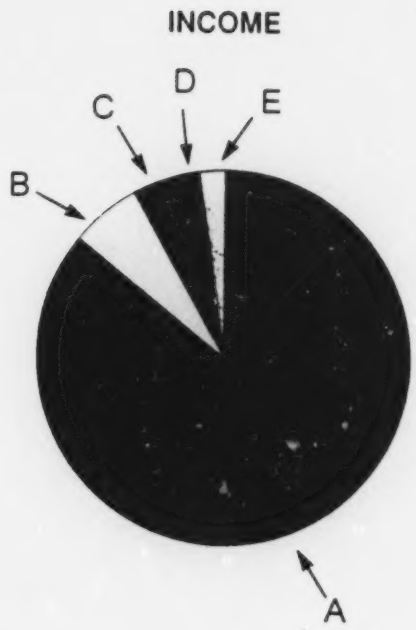
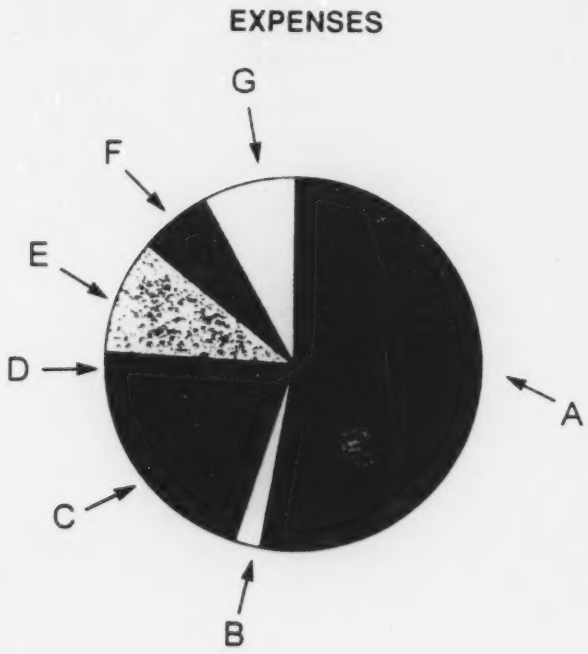
APPENDICES

Appendix A

Funding Sources

1994 - 1995 Fiscal Year





INCOME

A. Tuition & Fees	$4,773,250	86%
B. Student Fund Raising	$ 309,600	6%
C. Auxiliary Enterprises (net)	$ 223,560	4%
D. Development Income	$ 96,750	2%
E. Investment Income	$ 107,640	2%
TOTAL	$5,510,800	100%

EXPENSES

A. Instructional Programs	$2,893,360	53%
B. Student Services and activities (net)	$ 102,660	2%
C. Administration	$ 972,060	18%
D. Office of Institutional Advancement	$ 187,910	3%
E. Maintenance	$ 530,960	10%
F. Fixed Charges and Capital Expenses	$ 356,650	6%
G. Transfers Due to Other Funds	$ 438,000	8%
TOTAL	$5,481,600	100%

Appendix B

Administrative Study

TARGET AREA STUDENT ACHIEVEMENT DATA

TARGET AREA: CRITICAL THINKING

INTRODUCTION:

As we began the process of assessing our students' critical thinking skill, our initial difficulty was accurately defining the skills of critical thinking. In order to overcome this difficulty we relied on the target goals as stated by the Cross Disciplinary Team and supplemented these goals with data sources which reflected a variety of skills integral to critical thinking.

As standardized tests are overwhelmingly designed to measure critical thinking, many of the assessments presented in this report are standardized testing instruments. However, it should be noted that standardized tests present a very limited view of a student's ability to think critically; it is with this in mind that we also present data from random faculty and student surveys and interviews.

DATA PRESENTATION:

TARGET GOAL #1: Students will be able to effectively solve problems by:

- defining the problem
- identifying possible causes and effects of the problem
- selecting an appropriate problem-solving model
- proposing solutions and alternatives and their consequences
- identifying necessary resources for resolving the problem
- defending their solutions
- evaluating the process used to solve the problem

DATA SOURCES:

1. PLAN TEST FOR THE CLASS OF '95:

The PLAN test is a practice ACT test completed by students in the fall of their sophomore year. The test consists of the four sections tested on the ACT test, English, Mathematics, Reading and Science Reasoning. Scores on the four PLAN tests and the Composite are reported on the same scale used for the ACT. Thus, a student who took the PLAN and ACT at the same time would be expected to receive approximately the same scale score on both tests. The score scale for ACT has a range of 1 - 36. Because the PLAN is shorter and less difficult than the ACT, scale scores on each PLAN test and the composite range from 1 - 32.

2. ACT TEST SCORES IN MATH AND SCIENCE FOR THE CLASS OF '95:

The ACT Assessment Program is a comprehensive evaluative, guidance, and placement service for students and educators involved in the transition from high school to college. It is based on the ACT Assessment, which consists of four academic tests, self-reported high school grades, the Student Profile Section (SPS), and ACT interest inventory. The program also includes a number of supporting research services.

The Mathematics Test is a 60-item, 60-minute test that is designed to assess the mathematical skills that students have typically acquired in courses taken up to the beginning of grade 12. The test requires students to use their reasoning skills to solve practical problems in mathematics. Knowledge of basic formulas and computational skills are assumed as background for the problems, but complex formulas and extensive computation are not required. The material covered on the test emphasizes the major content areas that are prerequisites to successful performance in entry-level courses in college mathematics.
The Science Reasoning Test is a 40-item, 35-minute test that measures the student's interpretation, analysis, evaluation, reasoning, and problem-solving skills required in coursework in the natural sciences. The test is made up of units consisting of some scientific information (the stimulus) and a set of multiple-choice test items.

The arithmetic average of the scores on the four tests: English, Mathematics, Reading, and Science, is the ACT Composite score, which is often used as a measure of overall educational development.

3. CAT/5 ENTRANCE EXAM LEVEL 19 AND CAT/5 LEVEL 21/22 FALL '94 TEST FOR THE CLASS OF '95:

The CAT/5 is a complete assessment system that evaluates students' academic achievement from Kindergarten through grade 12. The Basic Skills Battery provides norm-referenced and curriculum-referenced data for Reading, Spelling, Language, Math and Study Skills. The level 19 test was administered to the Class of '95 in January of 1992 and level 21/22 was administered to the same class this fall.

4. Analysis of students named as Illinois State Scholars.

Status as an Illinois State Scholar is determined by combining a student's ACT score and class rank. It is anticipated that at least 10% of a senior class will be named as Illinois State Scholars.

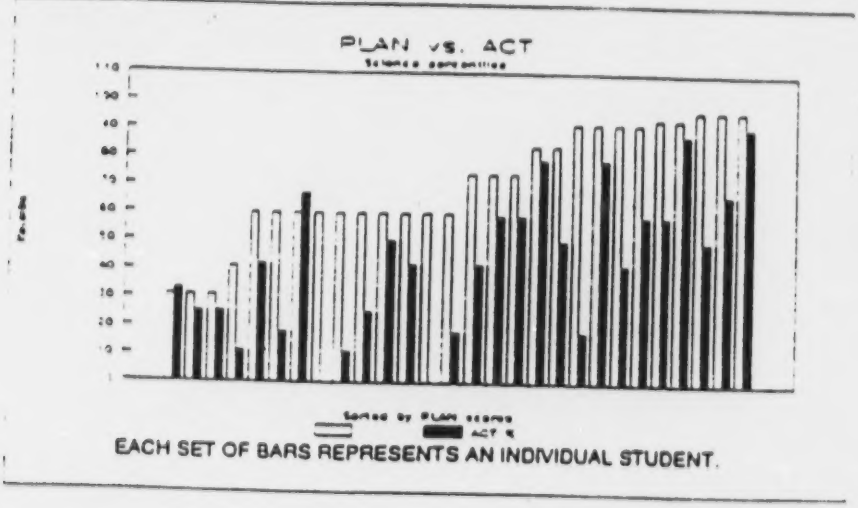
PRESENTATION OF DATA:

The graphs below compare the Science Reasoning scores and percentiles on the PLAN test and the subsequent ACT for a random selection of students. This comparison indicates that students perform much better on the PLAN test (which is a practice ACT test) than they do on the ACT. According to this data the skill in science reasoning declines between sophomore and junior year.

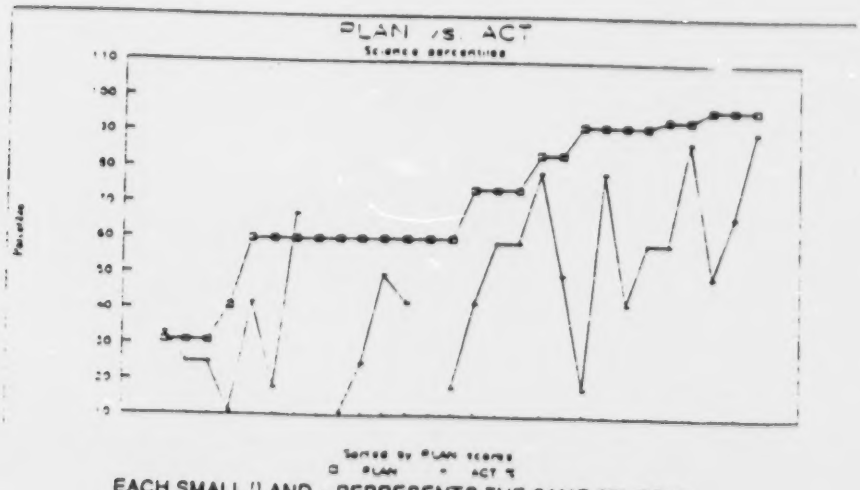
Science Reasoning Data

	PLAN	ACT
Average	70.39	46.18
Std Dev.	20.80	22.79
VAR	432.67	519.29
MAX	97	91
MIN	31	11

Interpretation: Science scores on PLAN forecast higher ACT scores than students achieve. (students' scores drop from sophomore to junior year).



EACH SET OF BARS REPRESENTS AN INDIVIDUAL STUDENT.



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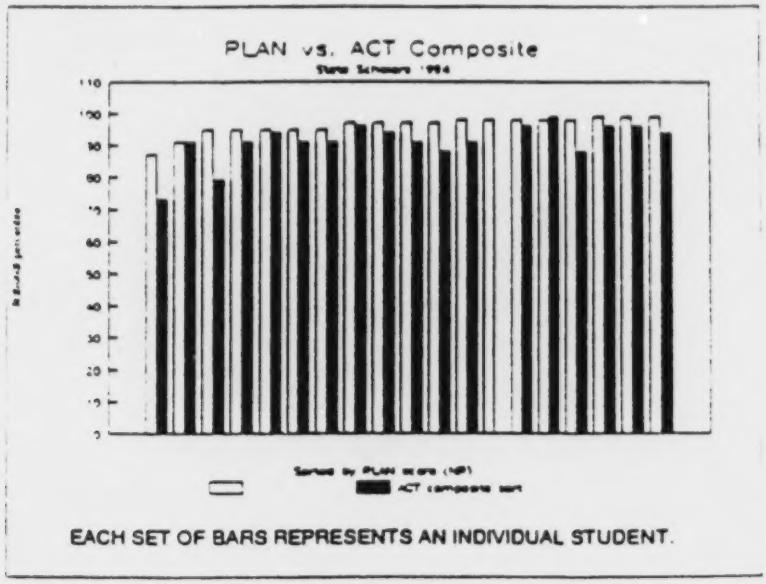
The graphs below compare the PLAN tests and ACT tests for those students who were named as Illinois State Scholars. For these students the ACT score is close to the PLAN test scores, however, the score on ACT, for the majority, is still lower than the PLAN test score. It should be anticipated that the ACT would be higher than the PLAN.

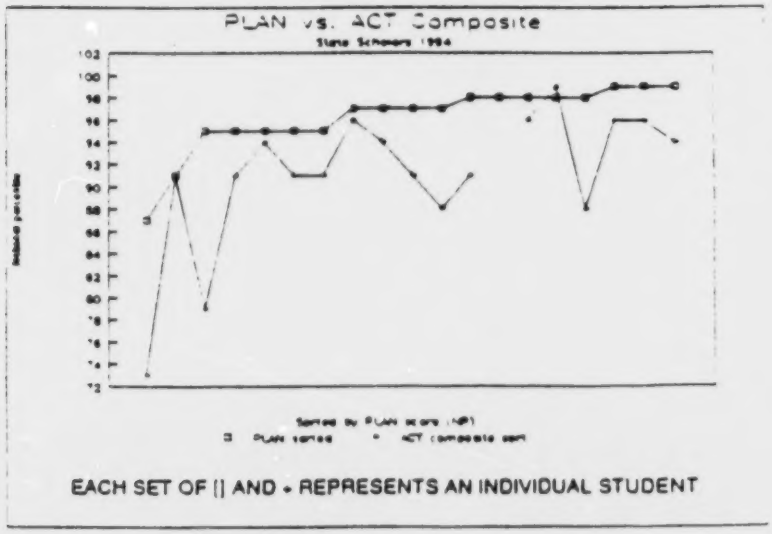
State Scholar Data

Average	96.2	91.08
Std. Dev.	2.91	6.13
Variance	8.48	37.61
Max	99	99
Min	87	73

Interpretation: State Scholars also lower on ACT than PLAN but only by 5%.



EACH SET OF BARS REPRESENTS AN INDIVIDUAL STUDENT.



EACH SET OF [] AND ◆ REPRESENTS AN INDIVIDUAL STUDENT

ANALYSIS OF DATA:

1. PLAN TEST SCORES AND ACT TEST SCORES:

In comparing the PLAN vs. ACT in both math and science, we found that their PLAN scores would have predicted a much higher ACT score than they actually received. In all cases but two the math and science ACT percentiles were lower. In comparing the overall ACT scores with CSI (Cognitive Skills Index - a score which is similar to an I.Q. score) which was reflected on the CAT/5 scores it would be predicted that the ACT scores should have been higher.

2. CAT/5 Test Scores:

In comparing the CAT/5 entrance exam with the CAT/5 administered in Senior year, we found that those students who scored poorly on the entrance exam showed a marked improvement when they took the exam in Senior year. Those students who scored well on the entrance exam showed little or no improvement. The majority of the students who scored in the middle actually showed a decline on the Senior test.

3. Illinois State Scholar Study:

A study of the students named as Illinois State Scholars was conducted. This group of students represents those of the highest ability in our Senior Class. Their average PLAN percentile was 96.2 and their average ACT percentile was 91. Even these students received a lower ACT score than their PLAN test predicted.

An examination of those students who were named Illinois State Scholar reveals significant differences in course pattern when compared to students who have achieved similar grade point averages but lower ACT scores. This data reveals that students who complete the math sequence which begins with Honors Algebra and continues with Plane and Solid Geometry, Trig and Pre-Calculus and also complete a science pattern of Biology, Chemistry, Physics and an AP course do much better on the ACT than students who complete other course sequence patterns.

CONCLUSIONS:

It should be noted that this target goal was measured using only standardized testing data, so, the conclusions reflect a limited assessment view into this area. It appears that at some point all students should be exposed to practice ACT tests and multiple choice test taking. These standardized test results indicate a strong need to improve the skills involved in achieving well on these types of tests. As these tests measure critical thinking ability, the data suggest a great student need to improve critical thinking.

TARGET GOAL #2: Students will be able to utilize specific and effective strategies to organize their time, materials and resources demonstrating personal responsibility for their work and learning.

DATA SOURCES:

Study skills section of the CAT/5 test administered to 30 randomly selected first year students.

PRESENTATION OF DATA:

The data available for the CAT scores was calculated from a random sample of 30 students from the 620 who took the entrance exam in January of 1994. The study skills portion of the test was the area of focus. The average score/national percentile of the 30 students was 71.8.

ANALYSIS OF DATA:

This score would suggest that our students are able to utilize specific and effective strategies, and/or organize their time, materials, and resources demonstrating personal responsibility for their work and learning.

CONCLUSIONS:

The target goal was measured using information taken from standardized testing data, (CAT/5), so it presents only one measure in this target. The data is self-reported, and incoming Frosh report that they have above average study skills. They scored 71.8 national percentile in this area. Given that this is an entry level test, (entrance exam), responses may not reflect accurate reporting. Data from the following goals points to this reporting discrepancy. As the North Central process continues, more accurate data will emerge in this area.

TARGET #3: Students will be able to demonstrate effective investigation skills and techniques by:

- being accurate and precise
- drawing on past knowledge
- being persistent
- considering all possible options and consequences
- questioning and monitoring their progress on an ongoing basis

DATA SOURCES:

In order to examine our students' attitudes in response to the skills in this target goal, the following data source was analyzed:

ACT STUDY POWER ASSESSMENT -- The ACT STUDY POWER ASSESSMENT is an assessment that consists of 100 statements about study skills. There are groups of statements which cover the areas of Managing Time and Environment, Reading Textbooks, Taking Class Notes, Using Resources, Preparing for Tests, and Taking Tests.

PRESENTATION OF DATA:

A simple random sample of 25 students from all levels was conducted. Students are scored either High, Low, or Typical.

The following was found after analyzing the datA:
In the area of Reading Textbooks, 44% scored low, while 40% scored typical. 12% of students scored high.

In the area of taking notes, 20% scored low, while 40% scored typical and 40% scored high.

In the area of Using Resources, 80% scored low, while 12% scored typical and 8% scored high.

In the area of Preparing for Tests, 52% scored low, while 24% scored typical and 24% scored high.

In the area of Taking Tests, 92% scored low, while 4% scored typical and 4% scored high.

ANALYSIS OF DATA:

In each of the categories assessed in the ACT Study Power Assessment, significant numbers of our students fall in the low category. This suggests that our students are not very able at:
Managing Time and Environment, Reading Textbooks, Taking Notes, Using Resources, Preparing for Tests, and Taking Tests.

CONCLUSIONS:

The data suggests that attention needs to be given to all the areas mentioned above. This would confirm the belief that accurate self-reporting may not be happening, as the 71.8 study skills percentile from Goal #2 does not match the responses from this (ACT Study Power) source of data. Of particular concern is the 92% scoring low in the area of Taking Tests, 80% scoring low in Using Resources, 52% scoring

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low in Test Preparation, and 44% scoring low in Reading Textbooks. This suggests that these areas be addressed, most especially Test Taking.

TARGET GOAL #4: Students will be able to apply analytic processes in various learning situations by:

- categorizing information
- identifying specific ways information may be analyzed
- integrating various methods of analysis

DATA SOURCES:

1. Survey given to students which assessed their ability to utilize informational resources and current methods of categorizing information.

2. Survey of faculty regarding perceptions of students' ability to apply analytic processes.

3. CAT/5 test scores from the 1993 all school testing day as analyzed by Michael Sullivan.

PRESENTATION OF DATA:

The following results were gathered:

1. Students responses to questions regarding the use of critical thinking skills indicate that the only critical thinking skill used frequently was brainstorming. Other skills show no significant pattern of use.

2. Faculty responses indicated a limited use of critical thinking strategies in the classroom.

3. On October 12, 1993 Queen of Peace seniors and First-year students took the CAT/5 Exam. The following is a summary of some basic observations based on CAT/5 scores which reflect critical thinking skills of analytic processing as demonstrated in Math and Science scores on this test.

Test results for the Senior Class were partitioned based on the course sequence a student followed in a particular discipline. These test scores reveal that as students take more science courses (particularly Biology, Chemistry, and Physics and one AP course), their scores increase. Also, it students who take four years of math score well on this exam. Overall, students scored below the national average in math.

Test scores in Science and Social Studies are consistent with the findings in Math.

ANALYSIS OF DATA:

1. & 2. The survey data used to analyze this skill indicates the need for implementation of critical thinking skills for both students and faculty. The data indicates skills currently used are limited.

3. The CAT/5 data would suggest an examination of the skills presented to students who complete the course pattern which results in higher scores to the skills presented in other course patterns.

CONCLUSIONS:

After evaluating the data, it appears that the majority of students sometimes engage in Critical Thinking behaviors. Brainstorming was the only skill listed as being used to a high degree. These responses suggest that education for faculty in the area of Critical Thinking should be emphasized. In addition, it appears faculty need to expand the usage of various components of Critical Thinking in the classroom, offering a more holistic view of Critical Thinking.

Also, the CAT/5 suggests that critical thinking skills be integrated more completely into the curriculum.

TARGET GOAL #5: Students will be able to make, act on, defend and evaluate informed decisions by:

- looking at the context in which the decision is being made
- examining personal values and other factors which inform the decision exploring alternatives and options

DATA SOURCES:

Survey administered to a random sample of 50 students.

In order to try to measure the skills named in Goal #5, a survey was created, asking students about their decision making processes.

PRESENTATION OF DATA:

The survey focused on using resources when making important decisions.

ANALYSIS OF DATA:

The data was looked at in two ways: first, the data was looked at as a whole, with all four levels as one, and then each level was looked at individually. The findings suggest that our students:

- sometimes gather information when making informed decisions

- usually turn to friends first when seeking advice on decisions (exception is first year students, who turn to parents first)
- sometimes can see at least three options/solutions to a problem
- overwhelmingly decide in favor of personal and moral values when making decisions
- most often change values per situation
- are overwhelming proud of their decisions, decide differently now than they did a few years ago, and feel the greatest factor influencing this change in decision making is due to their education.

CONCLUSIONS:

It appears that as our students mature, they move toward self-reliance, consider options, have a sense of moral values and feel proud of their decisions. They cite their education as the greatest influence on current decision making. This suggests that we are helping students create models for problem-solving, that are value driven and are not made in isolation.

While the decision-making and problem-solving of a personal nature seem to be areas of growth for our students, academic problem-solving is an area which needs attention.

FACULTY SURVEY
NORTH CENTRAL STUDY

PLEASE CHECK YOUR DISCIPLINE AREA:

Business ____ Christian Living ____ Fine Arts ____ Foreign Language ____

Language Arts ____ Math ____ Physical Education ____ Science ____

Social Studies ____

PLEASE CHECK THE LEVEL OF STUDENTS IN YOUR CLASSES:

Senior ____ Junior ____ Sophomore ____ Frosh ____

DIRECTIONS: Please respond to the following statements by circling the response that most accurately reflects your behavior.

1. I ask students to "think out loud".

   Daily Often Sometimes Never

2. I allow students to say "I can't".

   Daily Often Sometimes Never

3. I use learning logs/journals in my classroom.

   Daily Often Sometimes Never

4. I don't mind sharing with students **how** I tackle a problem/weakness.

   Daily Often Sometimes Never

5. I share the rationale/objectives of lesson/projects with students.

   Daily Often Sometimes Never

6. I make use of graphic organizers in presenting material/problems/strategies.

   Daily Often Sometimes Never

7. I require students to do some type of writing along with a reading assignment.

   Daily Often Sometimes Never

8. When I don't know an answer in class, I "think out loud" in figuring it out.

   Daily Often Sometimes Never

9. I hold open class discussions.

   Daily Often Sometimes Never

10. I see my role as a facilitator of student learning.

    Daily Often Sometimes Never

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STUDENT SURVEY
NORTH CENTRAL STUDY

YOUR LEVEL: Senior ____ Junior ____ Sophomore ____ Frosh ____

DIRECTIONS: Please respond to the following statements by circling the response that most accurately reflects your behavior.

1. I "talk to myself" when tackling a problem I'm not sure about.

   Always Sometimes Never

2. When I'm not sure of an answer on a multiple choice test, I guess randomly and move on.

   Always Sometimes Never

3. Brainstorming is necessary in creative problem-solving.

   Always Sometimes Never

4. When I'm frustrated/confused, I ask myself **why**.

   Always Sometimes Never

5. I use graphic organizers in my studying.

   Always Sometimes Never

6. I find class discussion helpful.

   Always Sometimes Never

7. When I don't know an answer I immediately ask someone else.

   Always Sometimes Never

8. Writing out ideas helps me to clarify them.

   Always Sometimes Never

9. I can see connections between things learned in one class to things learned in another class.

   Always Sometimes Never

10. I see my teacher's role as one of guidance and facilitation of learning.

    Always Sometimes Never

NORTH CENTRAL STUDENT SURVEY

CRITICAL THINKING---DECISION MAKING

LEVEL: FROSH SOPH JUNIOR SENIOR

1. Before making decisions, I gather information in order to make an informed decision:

   Always ____ Sometimes ____ Never ____

2. When I try to make informed decisions, I FIRST consult:

   ____ friends ____ parents ____ teachers ___ oth

3. When trying to make the right choice for me, I can create at least three other options/solutions:

   Always ____ Sometimes ____ Never ____

4. If faced with a moral conflict, I usually decide in favor of:

   ___ personal values ___ religious values ___ family values
   ___ peer values

5. Rate the following as the areas of consideration when involved in decision making: (1=most important, etc.)

   ___ moral values ___ peer pressure ___ parental values
   ___ societal norms (the way society thinks)

6. I find that my values change according to the situation: (robbing a bank is stealing, but cheating on a test is not)

   Always ____ Sometimes ____ Never ____

7. I am proud of my decisions, and willing to defend them, even if unpopular:

   Always ____ Sometimes ____ Never ____

8. I see that I make decisions differently now than I did when I was younger, say two years ago.

   ____ True ____ False

9. The greatest factor in the way my decision making has changed, (if it has) is due to:

   ___ education ___ parental influence ___ friends' infl
   ___ religious influence ___ societal norms

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Appendix C

Teacher Survey

TEACHER SURVEY

As many of you already know, Linda Casey, Chris Casiello, Bernie Gruca-Peal, and Bonnie Johnson are working on their master's degree through St Xavier/IRI At this point, we are working on our Action Research Project which involves trying to solve a problem relevant to our school We have chosen to work on addressing the needs of all students in a heterogeneous classroom It would be extremely helpful to us if you could take just a few minutes to fill out the following survey and return it to either Linda, Chris, or Bonnie as soon as possible We would really appreciate getting a survey returned from everyone It's anonymous, so don't sign it and please answer as honestly as possible

1 My classroom instruction is geared to students of (circle one) high ability
average ability
low ability

For the following questions, 1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree

2	Adequate classroom time is available for addressing the needs of students of all ability levels	1	2	3	4
3	I can readily identify the different ability levels in my classroom	1	2	3	4
4	The majority of my students are self-directed learners	1	2	3	4
5	Most of my students persist when problems occur in their learning	1	2	3	4
6	Students require constant stimulation to learn	1	2	3	4
7	I observe students using higher order thinking skills on a regular basis	1	2	3	4
8	Most students feel challenged by expectations set in my classroom	1	2	3	4
9	Students in my class set goals and actively monitor them	1	2	3	4
10	Do you feel you have sufficient strategies to address the extreme ends of the ability range in your classroom?	Yes		No	
11	Do you plan any extra activities or use any additional strategies to address students' individual needs?	Yes		No	

If yes, please give examples on back THANKS FOR YOUR HELP!!

Appendix D

Learning Channel Preference Checklist

To determine each student's learning preference styles, we used the Learning Channel Preference Checklist which can be obtained by writing

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Appendix E

Critical Thinking Questions

Read the following article taken from the April 1995 issue of DISCOVER magazine and answer the following questions.

Hotheads

Aprile Pazzo was about to call it a day when she noticed that the penguins she was observing seemed strangely agitated. Pazzo, a wildlife biologist, was in Antarctica studying penguins at a remote, poorly explored area along the coast of the Ross Sea. "I was getting ready to release a penguin I had tagged when I heard a lot of squawking," says Pazzo. "When I looked up, the whole flock had sort of stampeded. They were waddling away faster than I'd ever seen them move."

Pazzo waded through the panicked birds to find out what was wrong. She found one penguin that hadn't fled. "It was sinking into the ice as if into quicksand," she says. Somehow the ice beneath the bird had melted, the penguin was waist deep in slush. Pazzo tried to help the struggling penguin. She grabbed its wings and pulled. With a heave she freed the bird. But the penguin wasn't the only thing she hauled from the slush. About a dozen small, hairless pink molelike creatures had clamped their jaws onto the penguin's lower body. Pazzo managed to capture one of the creatures--the others quickly released their grip and vanished into the slush.

Over the next few months Pazzo caught several of the animals and watched others in the wild. She calls the strange new species hotheaded naked ice borers. "They're repulsive," says Pazzo. Adults are about six inches long, weigh a few ounces, have a very high metabolic rate--their body temperature is 110 degrees--and live in labyrinthine tunnels carved in the ice.

Perhaps their most fascinating feature is a bony plate on their forehead. Innumerable blood vessels line the skin covering the plate. The animals radiate tremendous amounts of body heat through their "hot plates," which they use to melt their tunnels in ice and to hunt their favorite prey: penguins.

A pack of ice borers will cluster under a penguin and melt the ice and snow it's standing on. When the hapless bird sinks into the slush, the ice borers attack, dispatching it with bites of their sharp incisors. They then carve it up and carry its flesh back to their burrows, leaving behind only webbed feet, a beak, and some feathers. "They travel through the ice at surprisingly high speeds," says Pazzo, "much faster than a penguin can waddle."

Pazzo's discovery may also help solve a long-standing Antarctic mystery. What happened to the heroic polar explorer Philippe Poisson, who disappeared in Antarctica without a trace in 1837? "I wouldn't rule out the possibility that a big pack of ice borers got him," says Pazzo. "I've seen what these things do to emperor penguins--it isn't pretty--and emperors can be as much as four feet tall. Poisson was about 5 foot 6. To the ice borers, he would have looked like a big penguin."

HOTHEAD QUESTIONS

1 What name did Pazzo give the "hotheads"?

2 Explain how the "hotheads" captured their prey?

3 What would happen if "hotheads" migrated into the Great Lakes?

4 Reread this article. What questions come to you regarding the existence and discovery of this organism?

5 How else would you find information on the "hotheads"?

6. After rereading this article, decide whether or not these organisms actually exist. Tell me what led you to your conclusion.

Appendix F

Base Groups

BASE GROUPS

Base groups will be assigned to work together for a minimum of one semester and possibly the entire year Groups will consist of 3-4 team members Once groups are assigned members should be given time to introduce themselves to each other and exchange phone numbers

The importance of working in a group should be discussed Group skills are important to learn and use for the rest of their lives Important skills in working in a group are communication, trust building, leadership, conflict resolution

Rules to be followed in the group are

CONTROL YOUR VOICE
THINK FOR YOURSELF
RESPECT OTHERS' OPINION
CARRY YOUR WEIGHT
HELP EACH OTHER STAY ON TASK
EXPLORE DIFFERENT POINTS OF VIEW
INCLUDE ALL MEMBERS

On the board use a T-chart and a double T-chart to go over teamwork and encouragement What do they look like, sound like, feel like

Remember the 5 squares game we played How important was cooperation?

JOURNAL #2 How is working in a group to complete a task different from working alone? Give examples from your own experiences

ROLE ASSIGNMENTS

ROLES

RECORDER Takes notes fills out final paper to be turned in Everyone should take their own notes, but recorders are the official copy Each person must sign the final copy (meaning "this is my best work")

WORRIER Makes sure everyone agrees on instructions
If there is a disagreement, asks for help
Sees that all members have equal chance to participate
Keeps group on task

MATERIALS MANAGER Gets all materials & returns them
Makes sure group cleans up when task is completed

OBSERVER Keeps track of time

RECORDERS

Tallies specific social skills being used by group

ENCOURAGER Keeps morale of group up by encouraging each member to participate and praises members for jobs well done

BONDING OF BASE GROUP

10 ways to bond cooperative groups

-Use one worksheet and one marker or pencil per group
-Design a group ad
-Create a group song
-Make a group motto
-Make a group flag
-Set group goals
-Decide on a name for the group
-List group accomplishments
-Create group rewards
-Brainstorm similarities among the group members

Appendix G

Goal Setting Lesson

GOAL SETTING LESSON 1

1 Have students recall a time when they really wanted something, worked hard, and got it Share

2 Relate own goal to students

3 Define goal Specifying a direction to set for yourself Monitor your progress in that direction

4 Guidelines
  a Begin with short term goals
  b Make sure goals are concrete
  c Failure is ok

5 Short term goals

6 Long term goals (handout)

7 Have students identify some goals

8 Have students set time frames

LESSON 2

Model a short term goal going to the show on Saturday, have a friend stay over on the weekend

Model a long term goal to get an A or B on a science test

Explain KWL
  Survey chapter 2
  Do KWL
  Construct a goal for the chapter

Pair share
  make sure goals are concrete
  goals should follow guidelines

GOALSLES WPS

Appendix H

KWHL

What We **Know**	What We **Want** to Find Out	**How** Will We Find It	What We **Learned**

Appendix I

Semester Project

BIOLOGY CLASS PROJECT TIMELINE

Due Date		
_____	I. Discuss Project/Topics/Group/Scoring	
_____	II. Topic Idea	3 pts.
_____	III. Type of Written Work & "Other" Work	3 pts.
_____	IV. Proposals Topic narrowed/Type of written/other Why is this a good topic (sell me idea)	10 pts.
_____	V. Notes from day 1 at Library	5 pts.
_____	VI. Notes from day 2 at Library	5 pts.
_____	VII. Rough Draft of Written Work	7 pts.
_____	VIII. Rough Draft of "Other" Work	7 pts.
_____	IX. Final Written Work	25 pts.
_____	X. Final "Other" Work	20 pts.
_____	XI. Evaluations: Self	3 pts.
	Class	3 pts.
	Teacher	4 pts.
_____	XII. Log/Journal/Brainstorm/Reflecting	5 pts.
		100 pts.

BIOPROJ.WPS

LOGS/JOURNALS/BRAINSTORMING/REFLECTION

1. K_{now} W_{ant to know} H_{ow to find out} L_{earned}

2. Brainstorm - web
   concept map

3. Thinking at Right Angles

4. How do you feel you did overall?

5. Which project did you enjoy the most and why?

GRADESHEET WRITTEN PORTION

2 points each except where noted (25 pts.)

1. Did you keep with proposal? _____
2. Was there an introduction? _____
3. Did the paper flow from the introduction? _____
4. Was there a conclusion? _____
5. Spelling _____
6. Grammar _____
- 1 7. Content/Quality of Research _____
- 2 8. Interesting/Innovative/Creative _____
9. Length Appropriate for number of people _____
10. Length appropriate to convey good information of your own. _____

_____
25

- 1 6 points
- 2 3 points

PROJRUB.WPS

GRADESHEET OTHER PORTION

2 points each (20 pts.)

1. Did you keep with proposal? _____
2. Neat _____
3. Creative _____
4. Interesting _____
5. Amount of work appropriate for number of people. _____
6. Conveys good information of your own. _____

*7. Voice level _____

*8. Eye contact _____

*9. Participation/Good Flow _____

*10. Opening/Closing _____

_____
20

*presentation

Appendix J

Language Arts Projects

EVALUATION AFTER PRESENTATION

I. CLASS 1 point each

1. Interesting _____
2. Informative _____
3. Easy to see _____
4. Easy to hear _____

II. TEACHER 1 point each

1. Did you hold everyone's interest? _____
2. Was visual easy to see? _____
3. Was it informative? _____

III. SELF 3 points

Rate yourself on a scale of 1 to 3 (with 3 being the best) and give an explanation to the following question.

"How do you feel you did on the presentation?"

ROMEO AND JULIET PROJECT

Hey students, guess what time it is?

Time for another fun-filled opportunity to use your creativity, knowledge, composition, and research skills! You will put together a magazine based on ROMEO AND JULIET. Here's the scoop:

Due: Monday, Dec. 18, BUT I will grade any that I get before that time early, and you will get it back before Christmas vacation --I Promise! Honest! No Kidding!

What's included and how many points:

10 -- Cover, layout, creativity

20 -- Play or movie review. This begins with a summary of the story (10 pts- and DON'T copy from CLIFF'S NOTES- I have them, too) and then a written review of either the play or the movie (the other 10 points). This would include what you liked and did not like about the actors and how they played their parts; the set, props, scenery, costumes; how true do you think the director was to Shakespeare's meaning; would you recommend it? Remember, you must be specific to get the full 10 points--back up your opinions with specific examples.

5 -- Tell what you learned about Shakespeare's life (in book)

10 -- Research -- Tell something about the times in which Shakespeare lived; not boring stuff like politics or religion, but things YOU found to be interesting about the everyday lives of the people. This might include how children were raised, how teenagers lived (was there such a thing), courting and marriage customs, how women were expected to act, what they were and were not allowed to do. Report on only one or two aspects of life. The whole article should be about 200-250 words (not counting 1 & 2 letter words)

5 -- Research -- One short "news blurp" about an historical fact that happened during this time. It might be about politics, an event, a noteworthy person of that time, a discovery, anything newsworthy (25 - 50 words).

5 -- Research -- Your choice of 1 thing:

Recipe	Decorating
Fashion	Garden
Architecture	

10-- Advice column -- After reading the play, you will probably say things like, "They were stupid, " or "What weirdo's!" Well, here's your chance to offer alternative solutions to R & J's problem. Think hard about what the lovebirds could have done so they could have been together in life, rather than apart in death.

20 -- Choose 2 of the 5 discussion questions on p.477. Write a full page essay on the 2 of your choice.

-- Horoscope - Choose at least 5 characters about which to write a horoscope. It must be specific enough that I can tell whom you are writing about; do not make it so general that it can apply to several characters. Poorly written example: Love is in the air and you will have thoughts of marriage (This can apply to 3 characters).

10 -- Choose 10 out of the 12 literary devices. Give one example of each that is not used in the explanation in the book.

allusion	heroic couplet
archaic word	metaphor
blank verse	personification
dramatic irony	plot line
foil	pun
foreshadowing	simile

Extra! Extra!

Extra credit --original comic --original music score
--authentic ad --extra horoscopes
--original poem --extra research

Bib

You must cite source for your research with a bibliographic entry AT THE BOTTOM OF THE PAGE OR UNDER THE AD

Ex: Wright, Louis B., and Virginia A. LaMar. ed. The Folger Guide to Shakespeare. New York: Washington Square Press, 1969.

or

"Shakespeare." Collier's Encyclopedia. 1992 ed.

Last page:
1. What are you most proud of and why?
2. What did you learn from doing this magazine?
3. What was the hardest and how did you figure out how to do it,
4. What would you do differently next time?

DECADES PROJECT

YOU

You are to research interesting info about your topic in the decade. You will write a paper using this info Instructions to follow.

TOPICS

HISTORY	SCIENCE & TECHNOLOGY	SOCIAL / HOME	ARTS / ENTER.
Politics	Science	ROLE OF WOMEN/KIDS	ART
Laws	Space	FASHION	MUSIC
Government	Electronics	HAIR / MAKE-UP	SPORTS
Economics	Communications	DECORATING	BOOKS
CIVIL RIGHTS	Building materials	FOOD	PLAYS / MOVIES
			RADIO, TV

GROUP

1. Take all the interesting information and put it together in a skit for the class. ex: lunch, sleepover, soda shop, grocery check-out, park
   Purpose: a) give information
   b) entertain
   - maybe costumes, props, ambiance of decade
   - bring 1 item of food to share with class (popular during decade)
   - Know info — Music.

2. Make a poster with xeroxed pictures, graphs or your drawings.
   - TITLE
   - back pictures (outline)
   - label everything (captions)

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Decades

Friday- Plan skit; practice

Weekend - Finish getting info & pictures at library.
Get NOTES, not paragraphs or sentences

Monday- 1) Put together poster; each groupmember should contribute at least 5 things. (bring 20¢ for ~~poster~~ board)
2) Finish skit. Skit and poster explanation should be a minimum of 10 minutes.
Practice!

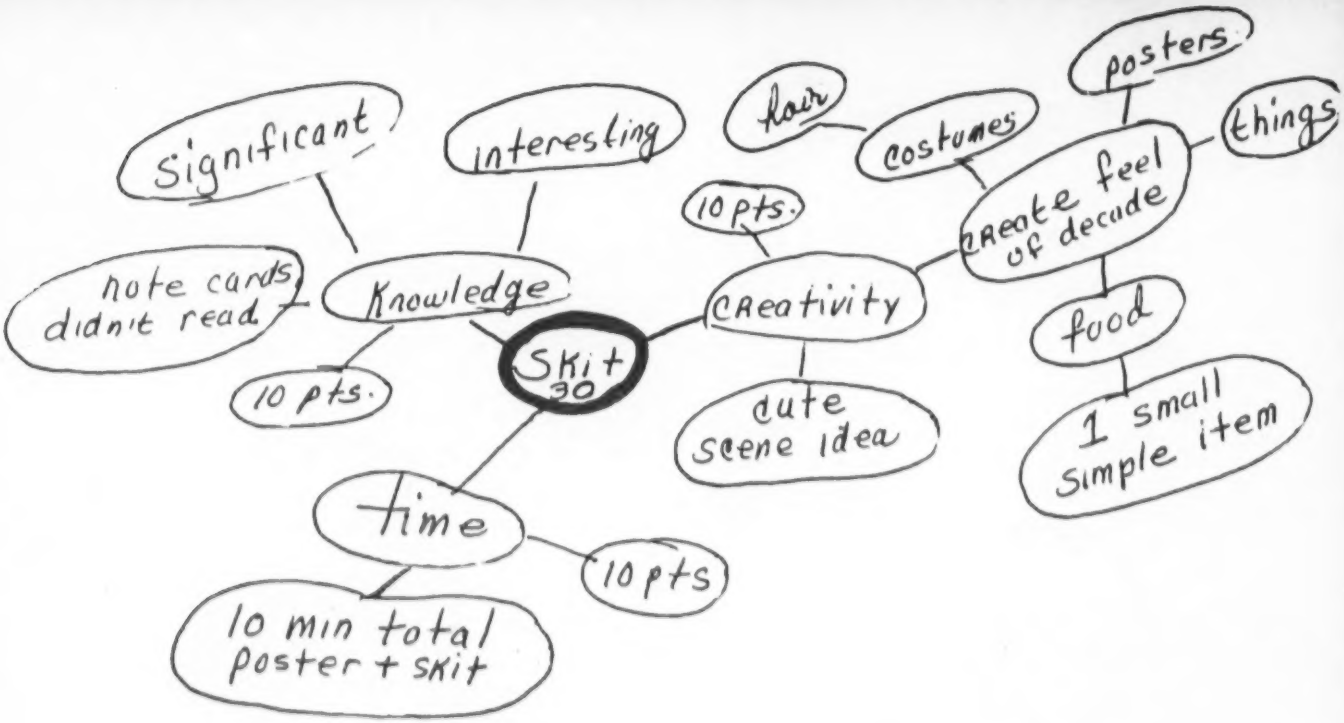
Tuesday- 10 min. to practice.
20's & 30's present.

Wednesday- 5 min to practice
40's, 50's & 60's present

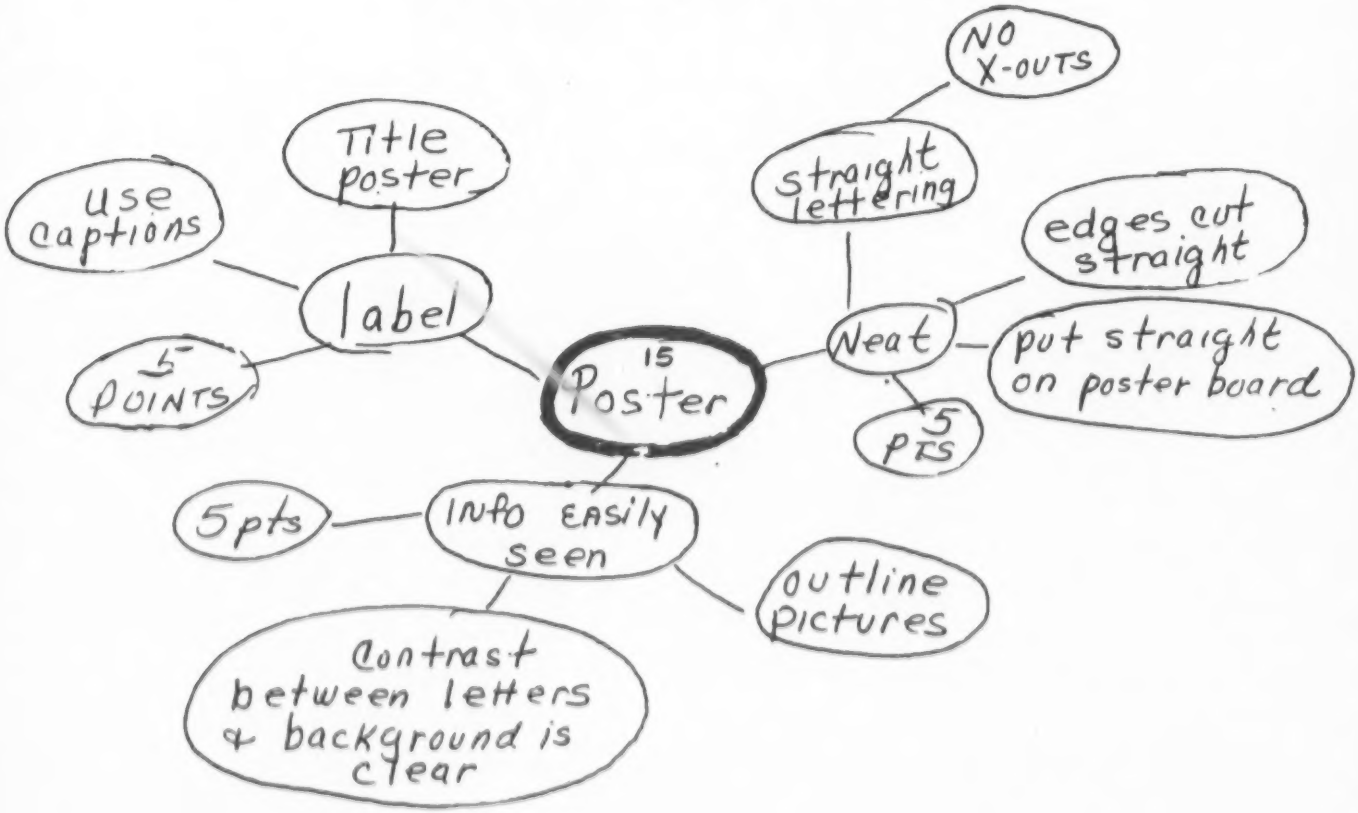
Thursday - 70's & 80's present

Friday - Evaluation
Rough draft of paper

Wednesday- Final draft of paper, typed.
Computer labs are open till four o'clock.


Significant
interesting
flour
costumes
posters
things
create feel of decade
10 pts.
creativity
note cards didn't read
Knowledge
Skit 30
10 pts.
cute scene idea
food
1 small simple item
time
10 pts
10 min total poster + skit

CRITERIA


NO X-OUTS
straight lettering
Title poster
use captions
label
edges cut straight
Neat
put straight on poster board
5 POINTS
15 Poster
5 PTS
5pts
INFO EASILY seen
outline pictures
Contrast between letters & background is clear

The paper- expository

at least 500 words
2 full typed pages,
double-spaced

Intro- Tell a little about the decade IN GENERAL.
Do not mention anything specific that happened.
One full paragraph

Body- Discuss your particular topic. You should have as many paragraphs as there are parts to your topic.

ex- History. You might have 4 paragraphs:
① politics, ② new laws, ③ economics, ④ civil rights.
(If you put civil rights under "social" it is OK.)

— Don't list. Here is an example of what NOT to do:

NO-NO!

In 1893 there was a terrible depression. Then in 1894 there was a railroad strike. Riots broke out. In 1896 McKinley became President. In 1898 the Spanish-American war broke out. Then in 1899 was the first "Open Door Note."

— Smoothly say a little about each thing:

better

In 1893 our country went through a terrible depression. Business was down and unemployment increased. More than one hundred railroads went bankrupt. People began to hoard money, withdrawing it in the form of gold from the banks. President Cleveland was blamed because he persuaded Congress not to allow silver to be coined. He also tried to end a railroad strike by force, and this angered many people. So in 1896, McKinley was elected President

I looked this up in a grade-school history book.

Conclusion - a few sentences to sum up the decade in general: What you feel was most important about it...

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Appendix K

Problem-based Learning Activities

SAFETY ACTIVITY

Students divide up into groups of two.

Each group will get at least one index card. (There are 15 index cards, and each one must be distributed, so some groups may have two cards.)

The group will decide how they want to present their rules to the other students. The three to five minute presentation must be oral and use a visual aid.

Give students safety handouts before the presentations begin.

Each group will make their presentation and students in the audience will follow along using their handouts taking any extra notes necessary.

REMIND students they will have a quiz over the information presented so they should pay careful attention and study the handouts on their own.

Experiment 3: A CLOSED BOX

Purpose: To determine the arrangement of objects in "closed boxes "
To design a "closed box" and develop a procedure for testing for the arrangement of objects inside it

Materials: Student "closed box" kits, materials of your own choosing to be used for making a "closed box "

Introduction: There are two kinds of observations that scientists can make, **direct observations and indirect observations**. When you observe the physical or chemical properties of a substance, you are making direct observations. These properties may be detected **directly** by using the five senses. This is a characteristics of direct observations.

We may also make observations indirectly. Indirect observations rely on **inference**. For example, you may be able to tell that a dog has been in the backyard overnight even though you have not seen it if it leaves its tracks in the snow.

When trying to determine the structure of something as small as the internal structure of atoms, scientists have only such indirect observations to rely upon. We cannot see particles that make up and atom, but they do leave "tracks" that can be used to infer their arrangement inside the atom. The model that scientists have made from the indirect evidence is the basis of the modern atomic theory.

In this experiment you will be given a "closed box" that contains some unknown objects. Without opening the box, you will be asked to test the behavior of the box in order to determine the internal arrangement. Once you have tested this behavior, you will be asked to make a model of this arrangement in the form of a diagram.

One of the most important aspects of how the modern atomic theory was tested was the development of ways of detecting subatomic particles and how they are arranged within atoms. In the second part of this experiment you will be asked to design your own "closed box" along with a means of detecting its internal structure.

Procedure:

Determining the Structure of a "Closed Box"

1. Obtain a numbered box from your teacher. Record the number.
2. Find out as much as you can about your box *without opening* it. Record the nature of each test you perform and record your observations.
3. Try to imagine in a general way what is inside the box that could account for your observations. This will be your model for the box. Do not try to name the objects inside the box. Only describe them by the properties that you found in your experiments, such as number of objects, their general shape, and their position in the box. Once you have written this description, make a diagram of this model.

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4. Bring the diagram of the box to your teacher who will check how closely your model resembles the design of the " closed box " Repeat the process predicting, testing, and revising if necessary until you have devised a model that satisfies all of your predictions

Designing a "closed box"

1 Design a "closed box" made from a cigar box or shoe box that contains one or more fixed objects and one or more movable objects. Be careful not to allow anyone to see your design Give a diagram of your design to your teacher

2 Construct a "closed box" based on your design.

3 Exchange "closed boxes" with another person, and try to predict the shape and arrangement of the object(s) inside the box. Diagram the internal structure of the box and record the observations that led you to this model . Show your diagram to the other person to find out if your model is accurate Report their findings.

4 Report how accurate the other person's model of your "closed box" was

5 Analyze the results of the experiment:

How accurate were your models?

If there were any inaccuracies, what were the causes?

Were these causes a result of errors on the part of designer?

Were these causes a result of the person trying to solve the box?

What could have been done to prevent such inaccuracies?

How accurate was the model the other person make of your box?

If there were any inaccuracies, what were the causes?

Were these causes a result of errors on the part of the designer?

Were these causes a result of the person trying to solve the box?

What could have been done to prevent such inaccuracies?

FLAME TESTS

When elements are heated to high temperatures, they may enter an excited state. In an excited state, the electrons move to higher energy levels. The changes in energy that occur when the excited electrons return to their ground state cause the substance to be luminous or emit light. The observed colors or **spectrum** of the substance is caused by the set of visible wavelengths of light emitted. Since each element emits a unique set of wavelengths, emission spectra cam be used as a tool to identify the elements.

One method used to demonstrate the emission spectrum of a substance is the flame test. Using this method, a small amount of a substance is heated and the characteristic glow of the substance is observed. In this experiment you will perform a flame test on several metallic salts. Based on your observations, you will develop a reference table which lists the flame color for each metal ion. You will then perform a flame test on an unknown substance. By comparing your observations to the data in your reference table, you will be able to identify the metal ion in the unknown substance.

OBJECTIVES

In this experiment, you will

- observe the spectra emitted from selected ions,
- identify metallic ions by the color emitted during vaporization, and
- evaluate the usefulness of this method of metal identification.

EQUIPMENT

goggles and apron
matches
ethyl alcohol
pipet
spoons
watch glasses
metal salts
triple beam balance

PROCEDURE

1. Prepare a data table. Safety goggles and lab apron must be worn for this experiment.

2. Each group should obtain an index card from the teacher containing the name of a metal salt. One spoon of the salt should be weighed out using the triple beam balance. Remember to record the value using the proper number of significant figures and the units.

3. Each group will bring the sample to the teacher at the fume hood, and when all the samples are ready the teacher will ask for a representative from each group to observe the flame test for the first salt.

4. The teacher will place a dropper of ethyl alcohol onto the sample, and will ignite the sample. As the sample burns, the group representatives will make observations. After the flame has died, the representative will return to the group to record the data.

5. The teacher will call for a new representative from the groups, and the experiment will proceed in the same fashion until all the salts have been used.

6. The teacher will call up the groups individually and ignite and unknown for the group to observe. Based on the previous flame tests the group must determine the identity of the unknown.

CONCLUSIONS

1. What metal ion would you predict to be contained in the sample of unknown? Why?

2. Based on your results and observations would this method be practical to determine metals in a mixture? If not, why not?

3. Give at least two reasons why the flame test is sometimes invalid.

4. What other means of qualitative analysis are used to identify metals?

FURTHER INVESTIGATIONS

1. Explain the difference between emission and absorption spectra.

2. Advertising lights are produced by sealed tubes of various noble gases which emit colored light when excited. Using references, explain the techniques used in producing the lights.

3. Describe the common characteristics of flame tests the would be observed if a spectroscope were used.

4. Use reference sources and determine the flame color for five additional metal ions.

SEMESTER ONE
REVIEW ACTIVITY

1. You may work alone or with a partner.

2. All work will be done on your own time. **NO** class time will be given.

3. You will sign up for a section of the material which was covered this semester.

4. You will design a mobile to illustrate your section.

5. In the mobile, you must a) identify your section
   b) define vocabulary words
   c) identify key concepts
   d) present things in a neat/unique fashion.

6. You will write three questions with answers covering your section.

7. This activity will be used as part of your grade on the semester exam.

EXPERIMENT 7: COVALENT MOLECULES

PURPOSE: To construct models of molecules of covalent substances in order to show how their shapes and structure determine their polarity.

MATERIALS: Molecular model kit.

INTRODUCTION: A covalent bond consists of a pair of shared electrons. If such a pair is shared equally between identical atoms, a bond is produced that is pure (nonpolar) covalent. If the electrons are shared unequally, then the bond formed is more or less polar.

Molecules of covlaent substances may be polar or nonpolar. A diatomic molecule of an elementary gas is nonpolar. A diatomic molecule of a compound is linear and is usually polar. More complex compouds have molecules which may be either polar or nonpolar, cepending on the symmetry of the bonds to the central atom and consequentlyu on the symmetry of the molecular structure. A moleculear structure , even though its bonds are polar is nonpolar if the bonds are arranged evenly about the central atom. When the arrangement of the polar bonds is asymmetrical, the resulting molecule is polar and is called a dipole. Representative molecules may be bent (angular) or trigonal pyramids. A dipole acts as isitively charged tion and a netatively charged portion equal in size of charge(s) and separated by some distance.

PROCEDURE: Construct a Data Table for these molecules that shows the following items: Electron-dot formula, bond type (polar or nonpolar), shape of molecule (linear, bent, trigonal pyramidal, tetrahedral), and kind of molecule (polar or nonpolar). Then assemble the first set of seven models: H_2, Cl_2, O_2, N_2, HCl, BrCl, and HBr and record the items required in the data table. Take these models apart and proceed similarly with the second set: H_2O,CO_2, H_2S, NH_3, CH_4, CCl_4, CH_3Cl.

QUESTIONS

1. In general an electronegativity difference of less than 0.4 between two elements indicates a nonpolar covalent bond, an electronegativity difference greater than 0.4 but less than 1.8 a polar covalent bond, and an electronegativity difference of 1.8 or more an ionic bond. Use Table 12.3, p. 285 of your text to determine the type of bond for each of the following: H-O, H-N, H-Cl, Br-Cl, H-S, H-C, Cl-Cl, C-O, K-Br, Na-O.

2. Classify each of the following as ionic crystal, polar covalent molecule, or nonpolar covalent molecule: Br_2, $MgCl_2$, CCl_4, HI, CO_2, H_2O, N_2.

3. Both water and carbon dioxide are triatomic molecules, yet one is polar and the other is nonpolar. Which of these molecules is polar? Which is nonpolar? Explain the difference between their molecular polarities.

Name: _____

Section: _____

Total Points: /25

Molarity Lab Practical

Outcome: The student will demonstrate proper laboratory technique as she mixes a solution with a specified volume and molarity.

1. CHOOSE A CARD.

2. CALCULATE the correct amount of compound necessary to mix your solution. (8 pts)

3. Mass out correct amount of compound using triple beam balance and use proper technique. (Can use analytical balance -3 pts) (5 pts)

4. CHOOSE correct volumetric flask to mix compound. (2 pts)

5. Add proper amount of compound and water to volumetric flask. (2 pts)

6. Demonstrate comprehension of the terms meniscus and dissolved. (4 pts)

7. Reflect on solubility of compound and a situation where you feel this technique might be useful. (4 pts)

Ms. Chemical Reaction Pageant

1. Students are divided into 5 groups

2. Each group is given a type of chemical reaction.

3. Each group must choose a representative to be Ms...

   Ms. Double Replacement
   Ms. Single Replacement

4. The group will write up a speech to relay information about their reaction to the class.

   They will choose music they feel represents their reaction.

5. The 5 Representatives will file into the room.
   Each representative will (in turn) walk around the room while her music is playing, return to the front to give her speech, and walk around again while music is playing.

6. The students will decide which representative best represented her reaction type and she will be

Ms. Chemical Reaction

Ch 15 Activity

1. Students are divided into groups of 5 using different colored jelly beans.

2. Each group chooses a card which lists two sections of Chapter 15.

3. The group reads their sections of Chapter 15 individually and they discuss the important information.

4. After discussion of important ideas, the groups plan a game or activity which will present their sections to the other groups.

5. The class as a whole creates a rubric the groups will use to grade one another.

6. The groups continue to work on project making any necessary changes.

7. The group sets up their activity or game. The groups will rotate every 7 to 10 minutes where they will play the game and do an evaluation.

8. As the groups are participating in steps 4-7, the teacher will circulate evaluating the group according to the observation checklist.

9. At the conclusion of the activity day, the groups will clean up their materials and will complete a group evaluation.

Observation Checklist

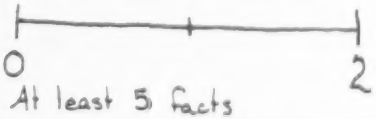
Preparation
- ___ On Task
- ___ Quiet Voices
- ___ Made Good Use of Time

Presentation Day
- ___ On Task
- ___ Quiet Voices
- ___ Prepared
- ___ Directions
- ___ Educational Value
- ___ Answers to Questions
- ___ Focused on individual activities

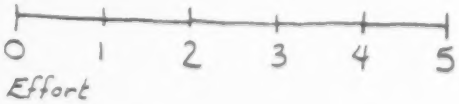
Group # _____
Total Score _____

Rubric for Ch 15 o

1) Easy to follow directions



2) At least 5 facts



3) Effort

4) Creativity / Colorfulness

5) Neatness

Total Score ____ pts

Group Evaluation

- ___ Did your group divide up responsibility?
- ___ Did your group stay on task?
- ___ Did your group encourage each other?
- ___ Did your group agree on the type of presentation?
- ___ Was your group prepared?

Group # _____
Total Score _____

Rubric for Ch 15 2

1) Creative / Colorful / Eye Pleasing

2) Playable / Easy to Understand

3) Relates to Topic

4) Did you learn anything?

5) Fun

6) Effort

Total Points ___

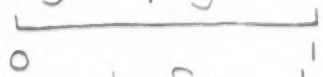
Rubric for Ch 15 3

1) Neatness

2) Creativity / Originality

3) 5 facts

4) Easy to play / understand

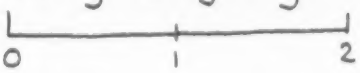


5) Easy to follow directions

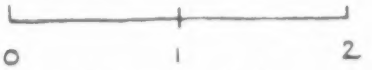
Total Points _____

Rubric for Ch 15 4

1) Creativity / Orignality

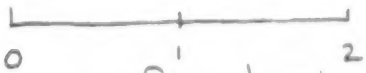


2) Neatness



3) Educational Value

4) Fun

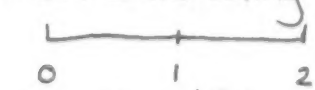


5) Easy to follow directions

Total Pints _____

Rubric for Ch 15 6

1) Fun / Interesting



2) Creative / Colorful

3) Playable

4) Easy to follow directions

5) At least 5 facts

Total Points _____

Appendix L

Intelligent Behaviors Self-Assessment Survey

Name_____Sec._____Date_____

Following is a list of behaviors. Rank yourself on a scale of 0 to 3 with **0** = I never use this behavior, **1** = I rarely use this behavior, **2** = I often use this behavior, and **3** = I always use this behavior.

___ 1. persistence*

___ 2. decreasing impulsivity

___ 3. listening to others with understanding and empathy

___ 4. flexibility in thinking

___ 5. awareness of thinking

___ 6. checking for accuracy and precision

___ 7. questioning and problem solving*

___ 8. applying past knowledge to new situations*

___ 9. precision of language and thought*

___10. creativity

*targeted intelligent behaviors

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